Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands	)	WT Docket No. 03-66 RM-11614

FIFTH REPORT AND ORDER

Adopted: June 6, 2014 **Released: June 9, 2014**

By the Commission:

I. INTRODUCTION

1. In this *Fifth Report and Order* ("*BRS/EBS OOBE R&O*"), we relax the out-of-band emissions ("OOBE") limits for Broadband Radio Service ("BRS") and Educational Broadband Service ("EBS") digital mobile stations ("broadband mobile devices") operating in the 2496-2690 MHz radio frequency ("RF") band ("2.5 GHz band"). These changes will enable operators to use BRS and EBS spectrum more efficiently and provide higher data rates to consumers. These changes will also promote greater consistency between the Commission's BRS/EBS technical rules and global standards for broadband mobile devices in the 2.5 GHz band, potentially making equipment more affordable and furthering the proliferation of broadband mobile devices, such as smartphones and tablets, that operate in the 2.5 GHz band.

II. BACKGROUND

2. *General:* To enable commercial operators to develop and deploy new and innovative wireless services, in 2004, the Commission fundamentally transformed the licensing and technical rules for the BRS and EBS. The Commission reconfigured the 2.5 GHz band into upper and lower-band segments ("UBS" and "LBS," respectively) for new two-way low-power operations, such as mobile and fixed wireless broadband services, and a mid-band segment ("MBS") for legacy one-way video high-power operations, such as long-distance learning.[1] In addition, the Commission reallocated and assigned an additional 5 megahertz to the BRS/EBS band at 2495-2500 MHz, and permitted BRS and EBS services to share the 2495-2500 MHz portion of the band on a co-primary[2] basis with operators in the Part 25 Mobile

[1] *See* Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, WT Docket No. 03-66, *Report and Order and Further Notice of Proposed Rulemaking*, 19 FCC Rcd 14165, 14182-14188 ¶¶ 36-49 (2004) ("*BRS/EBS R&O*"); *see also Order on Reconsideration and Fifth Memorandum Opinion and Order and Third Memorandum Opinion and Order and Second Report and Order*, 21 FCC Rcd 5606 (2006) ("*BRS/EBS 3rd MO&O & 2nd R&O*").

[2] Allocation of a given frequency band to a particular service on a primary basis entitles operators to protection against harmful interference from stations of "secondary" services. Further, secondary services cannot claim protection from harmful interference caused by stations of a primary service. *See* 47 C.F.R §§ 2.104(d) and 2.105(c). Co-primary means that the services share a frequency band on an equal basis, that facilities will be

(continued….)

Satellite Service ("MSS"), as well as grandfathered Part 74 Broadcast Auxiliary Service ("BAS") and Part 90 mobile service ("MS") and Part 101 fixed service ("FS") stations.[3] Under the new band plan, BRS Channel 1 ("BRS1") was relocated to 2496-2502 MHz from 2150-2156 MHz. BRS1 was the channel most affected by the Commission's decision to allow BRS/EBS operators and MSS, BAS channel A10, MS, and FS radio services to share the 2496-2500 MHz portion of the 2.5 GHz band. To reduce the potential for harmful interference to operations above and below 2495 MHz, the Commission created a one megahertz guard band at 2495-2496 MHz.[4]

3. To protect against adjacent channel interference and to facilitate mobile operations in the band, the Commission's 2004 decision also revised the OOBE limits for BRS and EBS licensees operating in the LBS and UBS, consistent with a proposal made by a coalition of organizations representing BRS and EBS licensees.[5] The Commission retained the existing OOBE limits for MBS analog operations, but applied the new OOBE limits to MBS digital operations with the result that all digital operations throughout the 2.5 GHz band would be subject to the same OOBE limits.[6] For mobile broadband devices, the Commission required that emissions outside the licensee's channel, or channels if combined, be attenuated below the transmitter power (P) by a factor of 43 + 10 log (P) decibels (dB) at the channel's edge, and 55 + 10 log (P) dB at 5.5 megahertz from the channel edge, where (P) is the transmitter power measured in Watts.[7] The Commission noted that MSS licensees operating in the adjacent band could seek tighter OOBE limits for BRS1 operations in cases of documented harmful interference.[8]

4. Since the Commission adopted these OOBE limits and other changes to the BRS/EBS services in 2004, Clearwire Corporation ("Clearwire") has become the predominant operator in the band.[9] Clearwire and other operators in the 2.5 GHz band use equipment designed according to the Worldwide Interoperability for Microwave Access ("WiMAX") version 802.16e standard, a technology based on the Institute of Electrical and Electronics Engineers ("IEEE") 802.16 standard, to provide wireless broadband service.[10] Sprint, which now controls 100 percent of Clearwire, has announced its intent to deploy a Time

(Continued from previous page)
protected based on the order in which the license applications are coordinated and authorized, and that the services have equal rights of protection against harmful interference from stations of secondary services.

[3] *See BRS/EBS R&O* at 14182-14187 ¶¶ 27-47. *See also* Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands, Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, Including Third Generation Wireless Systems, IB Docket No. 02-364, ET Docket No. 00-258, *Report and Order*, *Fourth Report and Order and Further Notice of Proposed Rulemaking*, 19 FCC Rcd 13356, 13387 ¶¶ 69-74 (2004) ("*Big LEO Spectrum Sharing Order*"); *Order on Reconsideration and Fifth Memorandum Opinion and Order and Third Memorandum Opinion and Order and Second Report and Order*, 21 FCC Rcd 5606, 5623- 26 ¶¶ 29-34; 5628-30 ¶¶ 38-42; 5631-32 ¶¶ 44-47 (2006) ("*Big LEO Spectrum Sharing Reconsideration Order*"); 47 C.F.R. § 2.106 NG 147.

[4] *See Big LEO Spectrum Sharing Order* at 13388-13389 ¶¶ 72-74.

[5] *See BRS/EBS R&O*, 19 FCC Rcd at 14213-14215 ¶¶ 124-130.

[6] *Id.* at 14215 ¶ 130.

[7] *Id.* at 14215 ¶ 128. *See also* 47 C.F.R. § 27.53(m)(4).

[8] *See BRS/EBS R&O*, 19 FCC Rcd at 14215 ¶ 129. Under the Commission's rules, harmful interference is defined as interference which endangers the functioning of a radionavigation service or of other safety services or seriously degrades, obstructs, or repeatedly interrupts a radiocommunication service operating in accordance with the International Telecommunication Union Radio Regulations. 47 C.F.R. § 2.1(c).

[9] Clearwire is now a wholly-owned subsidiary of Sprint Nextel Corporation. *See* Applications of SOFTBANK CORP., Starburst II, Inc., Sprint Nextel Corporation, and Clearwire Corporation, *et al*., IB Docket No. 12-343, *Memorandum Opinion and Order, Declaratory Ruling, and Order on Reconsideration*, 28 FCC Rcd 9642 (2013).

[10] *See* Comments of Clearwire Corporation, RM-11614 (filed Dec. 6, 2010) at 1-2.

Division Duplex ("TDD") system based on Long Term Evolution ("LTE"), another global standard for wireless broadband technology, in the 2.5 GHz band as part of its Sprint Spark service, which is currently available in 11 markets.[11] The Third Generation Partnership Project ("3GPP"), a consensus-driven international partnership of telecommunications standards bodies, developed LTE .[12] 3GPP has identified three band classes for LTE applicable to the 2.5 GHz Band:

- Band Class 7 (Frequency Division Duplex ("FDD")) operation with uplink operation in 2500-2570 MHz and downlink operation in 2620-2690 MHz);
- Band Class 38 TDD operation in 2570-2620 MHz); and
- Band Class 41 (TDD operation throughout the 2496-2690 MHz band).[13]

5. Sprint estimates that 100 million customers will have Sprint Spark or 2.5 GHz band coverage by the end of 2014.[14] IEEE and 3GPP state that they are refining their respective standards into new versions: WiMAX 2 (based on the 802.16m standard) and Advanced-LTE (3GPP Release 10 and beyond).[15]

6. To cope with increased demand for Fourth Generation ("4G") services while using spectrum efficiently, WiMAX2 and LTE-Advanced equipment will use channels that have bandwidths up to 40-100 megahertz.[16] In contrast, current WiMAX equipment typically uses channels that have a maximum bandwidth of 10 megahertz.[17] Although channels in the LBS and UBS, except for BRS1 and BRS Channel 2 ("BRS2"), are 5.5 megahertz, operators generally combine multiple channels to provide service.[18]

7. *WCAI Petition*: To permit operators to realize the full benefits of 4G technologies, such as WiMAX2 and Advanced-LTE, which can use wider bandwidth technologies, on October 22, 2010, the Wireless Communications Association International ("WCAI") filed a petition for rulemaking asking the Commission to revise the OOBE limits for mobile broadband devices operating in the 2.5 GHz band to accommodate channel bandwidths of 20 megahertz and wider.[19] WCAI stated that it is difficult for

[11] *See* http://newsroom.sprint.com/presskits/sprint-spark.htm.

[12] *See also* Comments of the Wireless Communications Association International, Inc. (filed July 7, 2011) ("WCAI Comments") at 3 and n.7.

[13] *See* LTE; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (3GPP TS 36.101 version 10.8.0 Release 10) ("LTE Release 10 Technical Standards") at 20 (Table 5.5-1 E-UTRA operating bands).

[14] *See* http://newsroom.sprint.com/presskits/sprint-spark.htm.

[15] *See* Standards Development Working Group - WG802.16 - Broadband Wireless Access Working Group (http://standards.ieee.org/develop/wg/WG802.16.html) and LTE Advanced (http://www.4gamericas.org/index.cfm?fuseaction=page&sectionid=352).

[16] *See* Report ITU-R M.2134, Requirements related to technical performance for IMT-Advanced radio interface(s) at 5 Section 4.3 (stating that IMT Advanced Technologies "shall support a scalable bandwidth up to and including 40 MHz," and encouraging operation in bandwidths up to 100 megahertz). *See also* ITU paves way for next-generation 4G mobile technologies; ITU IMT-R Advanced 4G standards to usher new era of mobile broadband communications, *Press Release* (Oct. 21, 2010), available at http://www.itu.int/net/pressoffice/press_releases/2010/40.aspx (designating LTE-Advanced and WiMAX2 as IMT-Advanced technologies).

[17] *See* Petition for Rulemaking, Wireless Communications Association, International, RM-11614 (filed Oct. 22, 2010) ("WCAI Petition") at 3.

[18] *See id.* at 4.

[19] *Id.* at 3.

mobile broadband devices operating in the 2.5 GHz band to meet the OOBE limits for 10 megahertz channels because of the limits of power amplifier efficiency inherent in current technology.[20] WCAI also asserted that it would be difficult or impossible to develop a smartphone that both complies with current out-of-band emissions standards and that could fully use a 20 megahertz channel bandwidth.[21] WCAI thus asked the Commission to relax the OOBE limits for mobile broadband devices operating in the 2.5 GHz band by modifying the attenuation factors that these devices must meet.[22] WCAI argued that this increase would allow operators to provide the full uplink capacity available in 20 megahertz or wider channels, and would align the Commission's OOBE limits with international standards developed by 3GPP for OOBE limits in the 2.5 GHz band.[23]

8. *BRS/EBS OOBE FNPRM:* In response to WCAI's petition, on May 27, 2011, the Commission released the *BRS/EBS OOBE FNPRM*, in which it found that enabling the use of wider channels in the 2.5 GHz band would enhance spectrum efficiency and throughput of mobile broadband devices operating in the 2.5 GHz band, and that aligning the Commission's rules with international standards could benefit both operators and consumers.[24] The Commission sought comment on whether it should modify the OOBE limits for mobile broadband devices operating in the 2.5 GHz band, and specifically sought comments on the OOBE limits (*i.e.*, attenuation factors) requested by WCAI, and outlined below.[25]

- 40 + 10 log (P) (where (P) is the transmitter power in Watts) dB at the channel edge, measured using a resolution bandwidth of 2 percent of the emission bandwidth of the fundamental emission in the 1 megahertz bands immediately outside and adjacent to the frequency block;
- 43 + 10 log (P) dB beyond 5 megahertz from the channel edges; and
- 55 + 10 log (P) dB attenuation factor at a separation of "X" megahertz from the channel edges, where "X" is the greater of 6 megahertz or the actual emission bandwidth as defined in Section 27.53(m)(6) of the Commission's rules.[26]

9. In addition to seeking comment on the specific OOBE limits proposed by WCAI, the Commission also inquired about the following issues:

- whether the proposed rule changes are necessary to permit mobile broadband devices to operate in the 2.5 GHz band using channel bandwidths wider than 10 megahertz;[27]

---

[20] *Id.* at 4-5. WCAI states that such a device would require additional filtering, which would lessen battery life and generate additional heat that would be difficult to dissipate. *Id*. at 5.

[21] *Id.*

[22] *Id.* at 6.

[23] *Id.* at 6.

[24] Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands, *Fourth Further Notice of Proposed Rulemaking,* WT Docket No. 03-66, 26 FCC Rcd 8133, 8138 ¶ 11 (2011) (*BRS/EBS OOBE FNPRM*).

[25] *Id.* at 8138 ¶ 12. *See also* WCAI Petition at 2.

[26] *Id*. 47 C.F.R. § 27.53(m)(6) defines the emission bandwidth "as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power."

[27] *BRS/EBS OOBE FNPRM,* 26 FCC Rcd at 8138 ¶ 13.

- whether the proposed rule changes would result in insufficient protection against harmful interference within the 2.5 GHz band, and if so, whether additional protections against such harmful interference would be needed;[28]

- whether the proposed rule changes would increase the potential for harmful interference into the MSS and BAS below 2495 MHz;[29]

- whether the Commission should adopt a fixed limit for OOBE below 2495 MHz or above 2690 MHz;[30]

- whether the proposed rule would work for channels wider than 20 megahertz without causing harmful interference to operations in adjacent bands;[31]

- whether the proposed rule changes would be consistent with IEEE's continuing development of WiMAX2, as well as other evolving standards;[32] and

- whether any additional changes to the OOBE limits applicable to digital mobile stations in the 2.5 GHz band are necessary or desirable to promote greater efficiency and flexibility in the provision of broadband services in these bands.[33]

10. *Comments and Clearwire Ex Parte*: Most commenters supported the *BRS/EBS OOBE FNPRM*'*s* proposed rule changes.[34] They argued that the proposed changes to the OOBE standard would allow faster data rates in the 2.5 GHz band,[35] align the Commission's rules with international standards,[36] maximize spectral efficiency and broadband throughput,[37] and permit manufacturers and network

[28] *Id.* at 8139 ¶ 14.

[29] *Id.* at 8139 ¶ 15.

[30] *Id.* at 8140 ¶ 16.

[31] *Id.* at 8140 ¶ 17.

[32] *Id.*

[33] *Id*.

[34] Comments of Alcatel Lucent (filed July 7, 2011) ("Alcatel Lucent Comments") at 2; Comments of Catholic Television Network and National EBS Association (filed July 7, 2011) ("CTN/NEBSA Comments"); Comments of Clearwire Corporation (filed July 7, 2011) ("Clearwire Comments"); Comments of GCT Semiconductor (filed July 7, 2011) ("GCT Comments"); Comments of Huawei Technologies (USA) (filed July 7, 2011) ("Huawei Comments"); Comments of Motorola Mobility, Inc. (filed July 7, 2011) ("Motorola Comments"); Comments of Nokia Siemens Networks US LLC and Nokia Inc. (filed July 7, 2011) ("Nokia Comments"); Comments of SEQUANS Communications (filed July 7, 2011) ("SEQUANS Comments"); Comments of the Telecommunications Industry Association (filed July 7, 2011) ("TIA Comments"); WCAI Comments.

[35] Clearwire Comments at 2 (describing tests Clearwire has conducted that achieve speeds of up to 90 Mbps using 20 megahertz channels); Motorola Comments at 2; TIA Comments at 3; WCAI Comments at 3.

[36] Alcatel Lucent Comments at 2; CTN/NEBSA Comments at 2; Clearwire Comments at 3; GCI Comments at 2; Motorola Comments at 2; Huawei Comments at 2; Nokia Comments at 2-3; SEQUANS Comments at 2; TIA Comments at 3-4; WCAI Comments at 4.

[37] CTN/NEBSA Comments at 2; Clearwire Comments at 4; GCI Comments at 2; Huawei Comments at 2-3; Motorola Comments at 5; SEQUANS Comments at 2; WCAI Comments at 3.

operators to realize enormous economies of scope and scale.[38] However, four commenters opposed the proposed changes, including Globalstar Corporation ("Globalstar"), the Engineers for the Integrity of Broadcast Auxiliary Services Spectrum ("EIBASS"), IP Wireless, Inc. ("IP Wireless"), and Northrop Grumman Systems Corporation ("Northrop Grumman").[39]

11. On October 18, 2012, in response to the opposition comments of Globalstar and EIBASS, Clearwire proposed a modification of the *BRS/EBS OOBE FNPRM's* proposal.[40] Under Clearwire's suggested approach, the relaxation of the OOBE limits proposed by WCAI would be implemented except for at and below the lower band edge of the 2.5 GHz band at 2496 MHz, where the current OOBE limits applicable to a channel with a lower edge at 2496 MHz would apply to all BRS/EBS channels.[41] Under this modified approach, the attenuation factors for mobile broadband devices operating in the 2.5 GHz band would be as follows:

- 40 + 10 log (P) (where (P) is the transmitter power in Watts) dB at the channel edge;
- 43 + 10 log (P) dB beyond 5 megahertz from the channel edges;
- 55 + 10 log (P) dB attenuation factor at a separation of "X" megahertz from the channel edges, where "X" is the greater of 6 megahertz or the actual emission bandwidth as defined in Section 27.53(m)(6) of the Commission's rules;
- 43 + 10 log (P) dB at 2496 MHz; and
- 55 + 10 log (P) dB at or below 2490.5 MHz.[42]

12. Clearwire also proposed that the Commission modify WCAI's proposal to change the way compliance with the OOBE limits is measured for BRS/EBS mobile digital stations. Under the Commission's current rules, compliance is measured using a resolution bandwidth of 1 megahertz or greater, except in the 1 megahertz bands immediately outside and adjacent to the frequency block, where a resolution bandwidth of at least 1 percent of the transmitter's fundamental emission may be used.[43] In its petition, WCAI had requested that the resolution bandwidth be changed to 2 percent in all portions of the 2.5 GHz band. Clearwire proposed that, except for the 2495-2496 MHz band, in the 1 megahertz bands immediately outside and adjacent to the frequency block under use, a resolution bandwidth of at least 2 percent of the fundamental emission be allowed to measure compliance.[44] In the 2495-2496 MHz band, the existing resolution bandwidth requirement of at least 1 percent would still apply.[45] Globalstar

[38] Alcatel Lucent Comments at 2; CTN/NEBSA Comments at 2; Clearwire Comments at 3; GCI Comments at 2; Huawei Comments at 2; Nokia Comments at 3; SEQUANS Comments at 2; WCAI Comments at 3.

[39] Comments of Globalstar, Inc. (filed July 7, 2011) ("Globalstar, Inc. Comments"); Comments of EIBASS (filed July 7, 2011) ("EIBASS Comments); Comments of IP Wireless, Inc. (filed July 7, 2011) ("IP Wireless Comments"); Reply Comments, Northrop Grumman Systems Corporation (filed July 22, 2011) ("Northrop Grumman Reply Comments").

[40] Letter from Cathleen A. Massey, Clearwire to Marlene H. Dortch, Federal Communications Commission at 1 (dated Oct. 19, 2012) ("Clearwire *Ex Parte*").

[41] Clearwire *Ex Parte* at 1; slide 6. Under our existing rules, a mobile broadband device using a 10 megahertz bandwidth channel in the 2496-2506 MHz band (the bottom of the 2.5 GHz band) must have an OOBE attenuation factor below the transmitter power (P) by a factor of 43 + 10 log (P) dB at 2496 MHz (the channel edge), and 55 + 10 log (P) dB at 2490.5 MHz (5.5 megahertz below the channel edge). *See* 47 C.F.R. § 27.53(m)(4).

[42] *Id*. at slide 8.

[43] 47 C.F.R. § 27.53(m)(6).

[44] Clearwire *Ex Parte* at slide 8.

[45] *Id.*

does not object to the modified Clearwire proposals.[46] No other commenting party objected to Clearwire's proposed modification.

III. DISCUSSION

13. We find that the public interest will be served by a modification of the OOBE limits for BRS and EBS mobile broadband devices as proposed in the *BRS/EBS OOBE FNPRM*, with the modifications proposed by Clearwire.[47] These changes will produce several benefits for operators and consumers.

14. First, by adjusting our OOBE standards, we can facilitate the use of wider channels, which will result in faster data rates and allow the use of advanced wireless technologies such as LTE-Advanced. Commenters unanimously tout the benefits of wider channels.[48] The record shows that changes to our OOBE standards are necessary to facilitate development of a device ecosystem that would fully take advantage of wider channels in the 2.5 GHz band. To that end, most equipment manufacturers support the proposed changes.[49] While IP Wireless states that it has developed a universal serial bus ("USB") stick that can operate with 20 megahertz channels and comply with the existing OOBE requirements,[50] it does not appear, given the state of current technology, that such performance can be cost-effectively replicated with highly mobile, highly integrated, multi-mode, multi-band smartphones.[51] Furthermore, there is a benefit in having a wide variety of equipment manufacturers providing devices that can operate on wider channels.

15. Second, the changes will conform our 2.5 GHz band OOBE limits to the emission mask standards established by 3GPP for 20 megahertz channels.[52] Adopting internationally harmonized OOBE standards for the 2.5 GHz band will result in several advantages for manufacturers, operators, and consumers. For example, internationally harmonized standards will allow manufacturers to produce equipment that can be used worldwide, lowering their development and production costs, thereby increasing consumer choice and supply and decreasing the cost of mobile broadband devices available for use domestically. In addition, harmonizing the standards will facilitate international roaming by

[46] Letter from L. Barbee Ponder IV, General Counsel & Vice President Regulatory Affairs, Globalstar Corporation to Marlene H. Dortch, Federal Communications Commission (dated Nov. 5, 2012) ("Globalstar *Ex Parte*") at 1 (Globalstar states that is has "no objection" to Clearwire's proposal).

[47] The rules we adopt today are slightly different than the rules proposed by Clearwire. The main purpose of the changes we make is to make clear where the OOBE standards apply over a range of frequencies. Specifically, while Clearwire proposes to adopt the 55 + 10 log (P) dB attenuation factor at a distance of "X" megahertz from the channel edges, the rule we adopt today applies that factor at "X" megahertz or more from the channel edges.

[48] Although IP Wireless opposes the specific changes proposed in the *BRS/EBS OOBE FNPRM*, it supports the use of wider channels. IP Wireless Comments at 2.

[49] *See* Alcatel Lucent Comments at 2; GCT Comments at 2; Huawei Comments at 2; Motorola Comments at 4; SEQUANS Comments at 2; TIA Comments at 2.

[50] *See* IP Wireless Comments at 3-4.

[51] *See* Reply Comments, Wireless Communications Association International, Inc. (filed July 22, 2011) ("WCAI Reply Comments") at 14-15.

[52] Specifically, the rules we adopt today will make our OOBE standards consistent with the general OOBE standards adopted by 3GPP for 20 megahertz channels. The 3GPP standards provide for an OOBE power of -10 dBm (-40 dBW), which corresponds to an OOBE attenuation factor of 40 + 10 log (P) dB (*see* Alcatel Lucent Comments at 1) up to 5 megahertz away from the channel edge, and an OOBE power of -13 dBm (-43 dBW), which corresponds to an OOBE attenuation factor of 43 + 10 log (P) dB up to 20 megahertz away from the channel edge. *See* LTE Release 10.8.0 Technical Standards at 61, Table 6.6.2.1.1-1: General E-UTRA spectrum emission mask.

consumers since there will be a consistent set of technical standards that will apply to broadband mobile devices.

16. Third, our action will facilitate the continued development of mobile wireless broadband services in the 2.5 GHz band. These changes will facilitate the use of TDD technologies, since TDD operations use a single wider channel, as opposed to the two narrower channels that are used in FDD operations. Our action will provide operators with additional flexibility to use the 2.5 GHz band more efficiently and more intensively.

17. Fourth, we can change our 2.5 GHz band OOBE rules without materially increasing the potential for harmful interference to other authorized services in bands adjacent to the 2.5 GHz band. In the *BRS/EBS OOBE FNPRM*, the Commission asked whether the proposed OOBE changes would materially increase harmful interference into the adjacent bands,[53] and, if so, whether the Commission should establish a fixed limit on out-of-band emissions below 2495 MHz or above 2690 MHz.[54] In response, Globalstar and EIBASS originally argued that amending the BRS/EBS mobile OOBE rule would greatly increase the probability of harmful interference to Big LEO MSS and BAS operations below 2495 MHz, especially in rural and remote areas.[55] Since that time, however, Clearwire proposed retaining the existing OOBE limits at and below 2496 MHz, which are currently applicable to a channel with a lower edge at 2496 MHz (*e.g.*, Channel BRS1), as "band edge" limits for all BRS/EBS channels,[56] and Globalstar has stated that it has no objection to that proposal.[57] Retaining the existing Channel BRS1 OOBE limits at and below 2496 MHz for all BRS/EBS channels would also address EIBASS' concerns about increased interference to BAS Channel A9 (2467-2483.5 MHz)[58] because BRS/EBS mobile units will not be allowed to increase OOBE below 2496 MHz. While several parties had expressed concern that establishing different limits at lower edges of the 2.5 GHz band would negate many of the advantages of allowing wider channels,[59] we agree with Clearwire that the revised OOBE limits that we adopt today will allow licensees to provide enhanced broadband services to their subscribers by operating with wider channels throughout most of the 2.5 GHz band, as well as support international roaming, without materially increasing the potential for harmful interference to other authorized services in adjacent bands.[60]

18. EIBASS also expressed concern about increased interference to BAS Channel A10 (2483.5-2500 MHz).[61] With respect to the 2491-2500 MHz portion of that channel, that portion could, in theory, be subject to increased interference from certain adjacent channel BRS/EBS mobile units' increased OOBE.[62] However, we believe the chance of harmful interference to BAS Channel A10 is very

[53] *BRS/EBS OOBE FNPRM,* 26 FCC Rcd at 8139 ¶ 15.

[54] *Id.* at 8140 ¶ 16.

[55] Globalstar, Inc. Comments at 1; EIBASS Comments at 2.

[56] Clearwire *Ex Parte* at slide 8.

[57] Globalstar *Ex Parte* at 1.

[58] *See* EIBASS Comments at 2.

[59] *See* GCT Comments at 3; Huawei Comments at 2; Nokia Comments at 3-4; SEQUANS Comments at 3; WCAI Comments at 5.

[60] Clearwire *Ex Parte* at Slide 7.

[61] EIBASS Comments at 2; *see also* Reply Comments of EIBASS (filed July 22, 2011) ("EIBASS Reply Comments") at 1-3.

[62] Under Clearwire's relaxed OOBE parameters, the theoretical increase in potential interference would result because mobile units operating with a 20 megahertz channel at 2511-2531 MHz would only be required to attenuate OOBE by a factor of 43 + 10 log (P) dB above 2491 MHz, while under the current rules, they are required to

(continued….)

low for several reasons. First, we note that BAS Channel A10 is currently subject to OOBE from BRS/EBS base stations, which can operate at higher power than mobile units.[63] Notwithstanding this fact, we are unaware of any allegation or complaint that BRS/EBS operations have caused harmful interference to BAS Channel A10 operations.[64] Second, there are many fewer operations on BAS Channel A10 (56 active licenses) than on any other BAS channel,[65] and BRS/EBS mobile stations are unlikely to be operated in close proximity to BAS receiving antennas, which are typically located on the same or similar structures as TV broadcasting antennas. Third, because the primary use of the 2.5 GHz band is for TDD operations, we believe BRS/EBS operators are unlikely to use channels at or near the lower edge of the 2.5 GHz band in situations where base stations may cause harmful interference to BAS or MSS operations. We therefore conclude that any potential increase in OOBE is highly unlikely to result in harmful interference to the BAS.

19. Under Clearwire's suggested approach, any BRS or EBS channel can operate under the relaxed OOBE limits except at 2496 MHz, where the existing OOBE limits applicable to a channel with a lower edge at 2496 MHz would apply.[66] Thus under the actions we take today, the current OOBE limits applicable to a channel with a lower edge at 2496 MHz will apply, *inter alia*, to channel BRS1 and EBS Channels A1 and A2, assuming a channel with a bandwidth of 20 megahertz.[67] By adopting Clearwire's proposed modification, we ensure that Globalstar's operations, BAS operations on channels A9 and A10, and Part 90 MS and Part 101 FS stations will continue to be protected, that BRS and EBS operators may operate broadband mobile devices at optimal power and with wider channel bandwidths in most of the 2.5 GHz band, and that the 2.5 GHz band will be able to support international roamers.[68]

20. The relaxed OOBE limits for broadband mobile equipment operating in the 2.5 GHz band will not materially increase the potential for harmful interference within the 2.5 GHz band. While we do not casually adopt looser OOBE standards, modest relaxing of our OOBE rules in line with the 3GPP standards is not likely to result in harmful interference to other BRS/EBS stations. Furthermore, as noted above, most operators and equipment manufacturers support the proposed standard.[69] IP Wireless is concerned about the coexistence of multiple unsynchronized TDD systems operating with relaxed OOBE

(Continued from previous page)
attenuate OOBE by a factor of 55 + 10 log (P) dB. For mobile units operating with a 20 megahertz channel at 2502-2522 MHz, a theoretical increase in potential interference would result because they would only be required to attenuate OOBE by a factor of 40 + 10 log (P) dB from 2497-2500 MHz, while under the current rules they are required to attenuate OOBE by a factor of 43 + 10 log (P) dB from 2497-2500 MHz.

[63] *See* 47 C.F.R. § 27.53(m)(2). This base station OOBE is attenuated by 43 +10 log (P) dB.

[64] EIBASS expressed concern about a BRS license in Chicago and promised to file an *ex parte* reporting any interference to grandfathered BAS Channel A10 operations in Chicago. EIBASS Reply Comments at 3. EIBASS did not make any subsequent filings.

[65] EIBASS is correct that multiple transmitters can be authorized under a single license. *See* EIBASS Comments at 5. It is nonetheless true that BAS Channel A10 is much more lightly utilized than BAS Channel A9, which has 788 active BAS licenses.

[66] *See* Clearwire *Ex Parte* at Slide 6. Under our existing rules, a mobile broadband device with a 10 megahertz bandwidth in the 2496-2506 MHz band (the bottom of the 2.5 GHz band) must have an OOBE attenuation factor below the transmitter power (P) by a factor of 43 + 10 log (P) dB at 2496 MHz (the channel edge), and 55 + 10 log (P) dB at 2490.5 MHz (5.5 megahertz below the channel edge). *See* 47 C.F.R. § 27.53(m)(4). Under the rules we adopt today, all 2.5 GHz band mobile broadband devices must maintain an OOBE attenuation factor of at least 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. *See* Appendix A.

[67] *See id*.

[68] *See id.* at Slide 5.

[69] *See* ¶ 10, *supra*.

in the same area.[70] As WCAI pointed out, however, the potential for harmful interference among uncoordinated TDD systems or between TDD and FDD systems already exists in the 2.5 GHz band because, in the *BRS/EBS R&O*, the Commission sought to maximize flexibility for licensees in the band by allowing them to use the technology of their choice. Furthermore, WCAI stated that the Commission has provided mechanisms for licensees to resolve documented interference complaints.[71] IP Wireless has not shown that increased OOBE in the 2.5 GHz band will materially change the interference environment for BRS and EBS stations. In addition, IP Wireless has not shown that our existing rules for interference resolution between BRS/EBS licensees, which remain in place, together with coordination practices developed by BRS and EBS operators, are not sufficient to allow licensees to mitigate the potential for harmful interference that could result from increased OOBE in the 2.5 GHz band. Our existing rules and industry practices together will enable BRS and EBS licensees to mitigate any increase in the potential for harmful interference that results from increasing the OOBE limits for BRS/EBS digital mobile transmitters.

21. Northrop Grumman has experienced base-to-base adjacent channel interference, which was resolved by adding supplementary filtering to the relevant base stations.[72] Northrop Grumman expressed concern that as the customer base of the adjacent commercial carrier grows, the potential for commercial broadband mobile devices to interfere with a system for which Northrop Grumman is the systems integrator will increase significantly.[73] We find Northrop Grumman's concerns to be speculative. As WCAI has pointed out, the practical output power limitations of industry transmitter designs for 4G mobile broadband devices mitigate the potential for harmful interference.[74] Moreover, 4G mobile broadband devices using orthogonal frequency-division multiple access ("OFDMA") technology will typically not be allocated all available bandwidth while at the same time operating at full transmit power.[75] Motorola Mobility agreed, and argued that interference concerns are merely hypothetical because to maximize battery life and minimize intra-system interference, 4G mobile broadband devices operate under stringent power control.[76] The likelihood of harmful interference actually occurring is very small, Motorola Mobility continues, because typical 4G system design specifications limit the bandwidth that is typically used at full power, which in turn limits the OOBE.[77]

22. We also adopt Clearwire's proposed changes to the procedures for measuring compliance with the OOBE limits. Revising the resolution bandwidth used for measuring compliance with the OOBE limits will help ensure that our limits are consistent with international standards.[78] Clearwire's proposal was not opposed by any party. Therefore, we will change the rules to specify that, except for the 2495-2496 MHz band, in the 1-megahertz bands immediately outside and adjacent to the

---

[70] IP Wireless Comments at 4.

[71] *See* WCAI Reply Comments at 13-14.

[72] Northrup-Grumman Reply Comments at 1. We are not changing our OOBE standards for base stations in the 2.5 GHz band.

[73] *Id.* at 2.

[74] WCAI Comments at 6. WCAI argues that although the maximum EIRP for mobile devices in the BRS/EBS band is 2 Watts (33dBm), based on battery life and thermal design constraints, mobile broadband devices such as laptop cards and smartphones are typically designed to operate at a maximum of only 200 milliwatts (23 dBm). WCAI Comments at 6.

[75] WCAI Comments at 7.

[76] Motorola Comments at 6.

[77] *Id*.

[78] *See* Letter from Cathleen A. Massey, Vice President, Regulatory Affairs and Public Policy, Clearwire Corporation to Ms. Marlene H. Dortch, Secretary, Federal Communications Commission (filed Jan. 4, 2013).

frequency block under use, a resolution bandwidth of at least 2 percent of the fundamental emission be allowed to measure compliance. In the 2495-2496 MHz band, the existing resolution bandwidth requirement of at least 1 percent would still apply.

23. With respect to the remaining questions raised in the *BRS/EBS OOBE FNPRM*, the answers to those questions support adopting the rule changes we make today.[79] In response to the question of whether the changes would work for channels wider than 20 megahertz, every commenter that addressed the issue supported allowing channels wider than 20 megahertz.[80] Moreover, keeping the existing protections to operations below 2496 MHz will eliminate any impact on adjacent channel licensees. Other than the Clearwire *Ex Parte*, we did not receive any proposals in response to our inquiry whether any additional changes to the OOBE limits applicable to digital mobile stations in the 2.5 GHz band are necessary or desirable.[81]

IV. PROCEDURAL MATTERS

A. Final Regulatory Flexibility Analysis

24. The Regulatory Flexibility Act (RFA)[82] requires that an agency prepare a regulatory flexibility analysis for notice and comment rulemakings, unless the agency certifies that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities."[83] Accordingly, we have prepared a Final Regulatory Flexibility Analysis concerning the possible impact of the rule changes contained in this *Fifth Report and Order* on small entities. The Final Regulatory Flexibility Analysis is set forth in Appendix B.

B. Paperwork Reduction Analysis

25. This document does not contain proposed information collection requirements subject to the Paperwork Reduction Act of 1995, Public Law 104-13. In addition, therefore, it does not contain any proposed information collection burden "for small business concerns with fewer than 25 employees," pursuant to the Small Business Paperwork Relief Act of 2002, Public Law 107-198, *see* 44 U.S.C. § 3506(c)(4).

C. Further Information

26. For further information contact Nancy M. Zaczek of the Wireless Telecommunications Bureau, Broadband Division, at 202-418-0274 or by e-mail to Nancy.Zaczek@fcc.gov.

V. ORDERING CLAUSES

27. Accordingly, IT IS ORDERED, pursuant to Sections 1, 2, 4(i), 7, 10, 201, 214, 301, 302, 303, 307, 308, 309, 310, 319, 324, 332, 333 and 706 of the Communications Act of 1934, 47 U.S.C. §§ 151, 152, 154(i), 157, 160, 201, 214, 301, 302, 303, 307, 308, 309, 310, 319, 324, 332, 333, and 706, that this *Fifth Report and Order* is hereby ADOPTED.

---

[79] *See BRS/EBS OOBE FNPRM,* 26 FCC Rcd at 8140 ¶ 17.

[80] *See* Clearwire Comments at 4; GCT Comments at 3; Huawei Comments at 3; Nokia Comments at 3; SEQUANS Comments at 3.

[81] *BRS/EBS OOBE FNPRM,* 26 FCC Rcd at 8140 ¶ 17.

[82] *See* 5 U.S.C. § 601–612. The RFA has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

[83] 5 U.S.C. § 605(b).

28. IT IS FURTHER ORDERED pursuant to Section 4(i) of the Communications Act of 1934, 47 U.S.C. § 154(i), that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Fifth Report and Order*, including the Final Regulatory Certification, to the Chief Counsel for Advocacy of the Small Business Administration.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch
Secretary

APPENDIX A

Final Rules

For the reasons discussed in the preamble, the Federal Communications Commission amends Part 27 of Title 47 as follows:

I. PART 27 – MISCELLANEOUS WIRELESS COMMUNICATIONS SERVICES

1. The authority citation for Part 27 continues to read as follows:

AUTHORITY: 47 U.S.C. 154, 301, 302, 303, 307, 309, 332, 336, and 337 unless otherwise noted.

2. Amend § 27.53 by revising paragraphs (m)(4) and (m)(6) to read as follows:

§ 27.53 Emission Limits.

*****

(m) * * *

(4) For mobile digital stations, the attenuation factor shall be not less than 40 + 10 log (P) dB on all frequencies between the channel edge and 5 megahertz from the channel edge, 43 + 10 log (P) dB on all frequencies between 5 megahertz and X megahertz from the channel edge, and 55 + 10 log (P) dB on all frequencies more than X megahertz from the channel edge, where X is the greater of 6 megahertz or the actual emission bandwidth as defined in § 27.53(m)(6). In addition, the attenuation factor shall not be less that 43 + 10 log (P) dB on all frequencies between 2490.5 MHz and 2496 MHz and 55 + 10 log (P) dB at or below 2490.5 MHz. Mobile Satellite Service licensees operating on frequencies below 2495 MHz may also submit a documented interference complaint against BRS licensees operating on channel BRS Channel 1 on the same terms and conditions as adjacent channel BRS or EBS licensees.

*****

(6) Measurement procedure. Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 megahertz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed; for mobile digital stations, in the 1 megahertz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least two percent may be employed, except when the 1 megahertz band is 2495-2496 MHz, in which case a resolution bandwidth of at least one percent may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 megahertz or 1 percent of emission bandwidth, as specified; or 1 megahertz or 2 percent for mobile digital stations, except in the band 2495-2496 MHz). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power. With respect to television operations, measurements must be made of the

separate visual and aural operating powers at sufficiently frequent intervals to ensure compliance with the rules.

*****

APPENDIX B

Final Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended ("RFA"),[1] we incorporated an Initial Regulatory Flexibility Analysis ("IRFA") of the possible significant economic impact on a substantial number of small entities by the policies and rules proposed in the *Fourth Further Notice of Proposed Rule Making ("FNPRM")*. Because we amend the rules in this *Fifth Report and Order*, we have included this Final Regulatory Flexibility Analysis ("FRFA"). This present FRFA conforms to the RFA.[2]

A. Need for, and Objectives of, the Proposed Rules

2. In this *Fifth Report and Order*, we relax the out-of-band emissions (OOBE) limits for mobile digital devices operating in the Broadband Radio Service ("BRS") and Educational Broadband Service ("EBS") in the 2496-2690 MHz band ("2.5 GHz band"), which limit the amount of energy that can be radiated outside a licensee's authorized bandwidth, but retain the current OOBE rules for operations at the lower edge of the 2.5 GHz band as "band edge" limits for all BRS/EBS channels. This change will enable smartphone, tablet computers, and other mobile broadband devices to use wider channel bandwidths, which could potentially allow higher data rates and more efficient use of spectrum. It would also increase the range of applications and devices that can benefit from mobile broadband connectivity, generating a corresponding increase in demand for mobile broadband service from consumers, businesses, public safety entities, health care institutions, educational institutions, and energy companies. The change also harmonizes standards in the equipment market for mobile devices in the 2.5 GHz band, which would make equipment more affordable and further the development of advanced wireless broadband devices. Retaining the current OOBE rules applicable to operations at the lower edge of the 2.5 GHz band for all BRS/EBS channels, however, helps protect co-primary operations in and adjacent to the 2496-2500 MHz portion of the band.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA:

3. No comments were submitted specifically in response to the IRFA.

C. Description and Estimate of the Number of Small Entities To Which the Proposed Rules Will Apply

4. The RFA directs agencies to provide a description of, and, where feasible, an estimate of the number of small entities that may be affected by the proposed rules and policies, if adopted.[3] The RFA generally defines the term "small entity" as having the same meaning as the terms "small business," "small organization," and "small governmental jurisdiction."[4] In addition, the term "small business" has the same meaning as the term "small business concern" under the Small Business Act.[5] A "small

[1] *See* 5 U.S.C. § 603. The RFA, *see* 5 U.S.C. § 601-612, has been amended by the Small Business Regulatory Enforcement Fairness Act of 1996, (SBREFA) Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

[2] *See* 5 U.S.C. § 604.

[3] 5 U.S.C. § 604(a)(4).

[4] 5 U.S.C. § 601(6).

[5] 5 U.S.C. § 601(3) (incorporating by reference the definition of "small-business concern" in the Small Business Act, 15 U.S.C. § 632). Pursuant to 5 U.S.C. § 601(3), the statutory definition of a small business applies "unless an

(continued….)

business concern" is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.[6] Here, we describe the small entities to which the rule will apply.

5. *Broadband Radio Service and Educational Broadband Service.* Broadband Radio Service systems, previously referred to as Multipoint Distribution Service ("MDS") and Multichannel Multipoint Distribution Service ("MMDS") systems, and "wireless cable," transmit video programming to subscribers and provide two-way high speed data operations using the microwave frequencies of the Broadband Radio Service ("BRS") and Educational Broadband Service (EBS) (previously referred to as the Instructional Television Fixed Service ("ITFS")).[7] In connection with the 1996 BRS auction, the Commission established a small business size standard as an entity that had annual average gross revenues of no more than $40 million in the previous three calendar years.[8] The BRS auctions resulted in 67 successful bidders obtaining licensing opportunities for 493 Basic Trading Areas ("BTAs"). Of the 67 auction winners, 61 met the definition of a small business. BRS also includes licensees of stations authorized prior to the auction. At this time, based on our review of licensing records, we estimate that of the 61 small business BRS auction winners, based on our review of licensing records, 48 remain small business licensees. In addition to the 48 small businesses that hold BTA authorizations, there are approximately 86 incumbent BRS licensees that are considered small entities (18 incumbent BRS licensees do not meet the small business size standard).[9] After adding the number of small business auction licensees to the number of incumbent licensees not already counted, there are currently approximately 133 BRS licensees that are defined as small businesses under either the SBA or the Commission's rules. In 2009, the Commission conducted Auction 86, the sale of 78 licenses in the BRS areas.[10] The Commission offered three levels of bidding credits: (i) a bidder with attributed average annual gross revenues that exceed $15 million and do not exceed $40 million for the preceding three years (small business) received a 15 percent discount on its winning bid; (ii) a bidder with attributed average annual gross revenues that exceed $3 million and do not exceed $15 million for the preceding three years (very small business) received a 25 percent discount on its winning bid; and (iii) a bidder with attributed average annual gross revenues that do not exceed $3 million for the preceding three years (entrepreneur) received a 35 percent discount on its winning bid.[11] Auction 86 concluded in 2009 with the sale of 61 licenses.[12] Of the ten winning bidders, two bidders that claimed small business status won

(Continued from previous page)

agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register."

[6] 15 U.S.C. § 632.

[7] *Amendment of Parts 21 and 74 of the Commission's Rules with Regard to Filing Procedures in the Multipoint Distribution Service and in the Instructional Television Fixed Service and Implementation of Section 309(j) of the Communications Act—Competitive Bidding*, MM Docket No. 94-131, PP Docket No. 93-253, Report and Order, 10 FCC Rcd 9589, 9593 ¶ 7 (1995).

[8] 47 C.F.R. § 21.961(b)(1) (1996).

[9] 47 U.S.C. § 309(j). Hundreds of stations were licensed to incumbent MDS licensees prior to implementation of Section 309(j) of the Communications Act of 1934, 47 U.S.C. § 309(j). For these pre-auction licenses, the applicable standard is SBA's small business size standard of 1500 or fewer employees.

[10] Auction of Broadband Radio Service (BRS) Licenses, Scheduled for October 27, 2009, Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, and Other Procedures for Auction 86, *Public Notice*, 24 FCC Rcd 8277 (2009).

[11] *Id.* at 8296.

[12] Auction of Broadband Radio Service Licenses Closes, Winning Bidders Announced for Auction 86, Down Payments Due November 23, 2009, Final Payments Due December 8, 2009, Ten-Day Petition to Deny Period, *Public Notice*, 24 FCC Rcd 13572 (2009).

4 licenses; one bidder that claimed very small business status won three licenses; and two bidders that claimed entrepreneur status won six licenses.

6. In addition, the SBA's placement of Cable Television Distribution Services in the category of Wired Telecommunications Carriers is applicable to cable-based educational broadcasting services. Since 2007, Wired Telecommunications Carriers have been defined as follows: "This industry comprises establishments primarily engaged in operating and/or providing access to transmission facilities and infrastructure that they own and/or lease for the transmission of voice, data, text, sound, and video using wired telecommunications networks. Transmission facilities may be based on a single technology or a combination of technologies."[13] Establishments in this industry use the wired telecommunications network facilities that they operate to provide a variety of services, such as wired telephony services, including VoIP services; wired (cable) audio and video programming distribution; and wired broadband Internet services. By exception, establishments providing satellite television distribution services using facilities and infrastructure that they operate are included in this industry.[14] The SBA has developed a small business size standard for this category, which is 1,500 or fewer employees.[15] Of those 31,996, 1,818 operated with more than 100 employees, and 30,178 operated with fewer than 100 employees.[16] Thus under this category and the associated small business size standard, the majority of such firms can be considered small. In addition to Census data, the Commission's Universal Licensing System indicates that as of July 2013, there are 2,236 active EBS licenses. The Commission estimates that of these 2,236 licenses, the majority are held by non-profit educational institutions and school districts, which are by statute defined as small businesses.[17]

D. Description of Projected Reporting, Recordkeeping, and other Compliance Requirements

7. This *Fifth Report and Order* imposes no new reporting or recordkeeping requirements and does not establish other compliance requirements.

E. Steps taken to Minimize Significant Economic Impact on Small Entities, and Significant Alternatives Considered

8. The RFA requires an agency to describe the steps it has taken to minimize any significant economic impact on small entities consistent with the stated objectives of applicable statutes.[18] We see no potential burden on small entities that hold BRS or EBS licenses. We believe our action today provides benefits to small businesses that hold BRS and EBS licensees, who would be able to use wider channel bandwidths to provide faster service and use their spectrum more efficiently.

---

[13] U.S. Census Bureau, 2007 NAICS Definitions, "517110 Wired Telecommunications Carriers," (partial definition), www.census.gov/naics/2007/def/ND517110.HTM#N517110.

[14] *Id.*

[15] 13 C.F.R. § 121.201, NAICS code 517110.

[16] *See* http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ECN_2007_US_51SSSZ2&prodType=table.

[17] The term "small entity" within SBREFA applies to small organizations (nonprofits) and to small governmental jurisdictions (cities, counties, towns, townships, villages, school districts, and special districts with populations of less than 50,000). 5 U.S.C. §§ 601(4)-(6).

[18] *See* 5 U.S.C. § 604(a)(6).

9. The main alternative considered was to adopt the proposed rule changes without maintaining the current level of interference protection to adjacent channel licensees below 2495 MHz. That alternative was rejected because it could have increased the potential for harmful interference to licensees operating below 2495 MHz and because it is possible for licensees in the 2.5 GHz band to get the benefits of wider channel bandwidths in most of the band without changing the out-of-band emission limits that apply below 2495 MHz.

Report to Congress:

10. The Commission will send a copy of this *Fifth Report and Order*, including this FRFA, in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act.[19] In addition, the Commission will send a copy of this *Fifth Report and Order*, including this FRFA, to the Chief Counsel for Advocacy of the Small Business Administration. A copy of this *Fifth Report and Order* and FRFA (or summaries thereof) will also be published in the *Federal Register*.[20]

[19] *See generally,* 5 U.S.C. § 801 (a)(1)(A).

[20] *See* 5 U.S.C. § 604(b).

APPENDIX C

List of Commenters to *BRS/EBS OOBE FNPRM*

Commenters
Alcatel Lucent
Clearwire Corporation (Clearwire)
DigitalBridge Communications Corp. (DigitalBridge)
Engineers for the Integrity of Broadcast Auxiliary Services Spectrum (EIBASS)
GCT Semiconductor (GCT)
Globalstar, Inc. (Globalstar)
Huawei Technologies (USA) (Huawei)
IP Wireless, Inc. (IP Wireless)
Motorola Mobility, Inc. (Motorola)
National EBS Association (NEBSA) and Catholic Television Network (CTN)
Nokia Siemens Networks US LLC (Nokia Siemens Networks) and Nokia Inc. (Nokia)
SEQUANS Communications
Telecommunications Industry Association (TIA)
Wireless Communications Association International, Inc. (WCAI)

Reply Commenters
EIBASS
Globalstar
Northrup-Grumman Systems Corporation (NGSC)
WCAI

Ex Parte
Clearwire
Globalstar